Recd 7/20/10 AM

Environmental Resources Management

350 Eagleview Blvd.
Suite 200
Exton, PA 19341
(610) 524-3500
(610) 524-7335 (Fax)
http://www.erm.com

15 July 2010

Ms. Linda Holden
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103

RE: Akzo Nobel Chemicals Inc., Delaware City, Delaware
USEPA Docket No. RCRA-III-005
Results of Supplemental Tetrachloroethene Delineation on Akzo Nobel Chemicals Inc., and Adjoining Premises

Dear Ms. Holden:

This letter transmits the third- and fourth-quarter data from the supplemental ground water sampling completed by Environmental Resources Management, Inc. (ERM) at the Akzo Nobel Chemicals Inc. (Akzo) site and adjoining premises in Delaware City, Delaware, in four consecutive quarters between May 2006 and February 2007. In addition, this letter summarizes the findings from the four quarterly sampling events.

Elevated concentrations of tetrachloroethene (PCE) were detected in previous samples collected from monitoring well P-5 located near the downgradient Akzo property boundary. The purpose of this supplemental sampling was to further clarify the extent of off-site PCE detections, update decade-old data on chlorinated organic levels on the Valero Refinery (Valero), examine concentrations versus water table levels and gradients across the two sites, and resample specific points of concern to DNREC.

Tasks that were completed during this scope of work included:

- collection of ground water samples in four consecutive quarters from wells P-5 and P-7 (Akzo); OW-50 (Formosa Plastics); MW-3S, MW-4S, MW-5S, MW-8S, MW-10S, 9MW-4, C5, and C33R (Valero); and

- collection of water level data in four consecutive quarters from the above wells.

The investigation methods and results are discussed below.

Methods

ERM collected ground water samples from the above list of wells, with the following modifications of the December 20, 2005 approved work scope, from May 2007 to February 2007. Well MW-6S was originally proposed for sampling and water level measurement; however it was found to be damaged and was therefore not sampled. Well 9MW-5 had been decommissioned; thus, with DNREC approval, well 9MW-4 was sampled instead.

Ground water samples were collected using low-flow sampling methods consistent with those approved for the RCRA Facility Investigation at the Akzo site. A QED micropurge pump was used to purge and sample each well. Field parameters (pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation-reduction potential) and drawdown were monitored and recorded at five-minute intervals during purging. Field parameters were collected using a YSI 6820 or 6920 flow-through water quality meter that was calibrated daily. A summary of the third- and fourth-quarter field parameter measurements is provided in Appendix A.

Following the completion of sampling at each well, the pump was decontaminated in the following manner:

- soap and water scrub using distilled water,
- distilled water rinse,
- 10% nitric acid spray,
- distilled water rinse,
- methanol spray (if the pump was grossly contaminated with hydrocarbons), then
- distilled water rinse.

In addition, the pump bladder, o-rings, screen, and grab plate were replaced after sampling was completed at each well.

A trip blank (one per cooler per field day), blind duplicate sample, matrix spike sample and matrix spike duplicate sample were collected for quality control purposes, in addition to the samples collected from each well.

All samples were submitted to Severn Trent Laboratories, Inc. (STL) in Edison, NJ for analysis of tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride using EPA SW-846 Method 8260B. The analytical data underwent a quality assurance validation upon receipt from STL (see Appendix B).

Results

Water table maps produced from the quarterly water level measurements collected from the above wells are provided as Figures 1 though 4; the water level data are summarized on Table 1. These contours showed relatively consistent patterns over the past four quarters. The water level data indicate that ground water from the vicinity of Akzo well P-5 flows easterly and northeasterly across the Akzo site and the Valero refinery. The contour shape was developed through a combination of mathematical interpolation and kriging of spot water table elevations. The resulting contours are consistent with the results of ground water modeling conducted for the draft Corrective Measures Study for the site.

The hydrographs developed using the 2006-2007 quarterly data and historical data are presented in Figures 5 and 6. The figures show consistent patterns of water level fluctuations among the monitored wells over the past four quarters. Up to 1.25 feet of water level fluctuation was observed over the four quarters. The pattern of the water level fluctuations is typical for the region: a higher water level in winter and spring due to higher recharge and lower evapotranspiration, and lower water table conditions in summer and fall due to higher temperatures and higher evapotranspiration.

Figure 7 presents the average PCE concentration results for the four quarters in plan view. The sampling results are also summarized in Table 2. Wells P-5, P-7, and MW-4S had the highest average PCE concentrations of 1,375 to 2,025 ug/l. Well P-7 exhibited significantly higher concentrations in 2006-2007 as compared to those observed in 2003. However, the same 2003 sampling event exhibited historical low concentrations at upgradient well P-5, leading to the conclusion that well P-7 concentrations could have been as high as currently observed at other times in 2003, had samples been taken at that time. Wells MW-10S and MW-5S, east and northeast of these wells, had an average of 270 and 198 ug/l of PCE, respectively. TCE and cis-1,2-DCE were also present in these five wells. These compounds were not detected in wells C5, 9MW-4, and C33R (located farther downgradient from wells MW-10S and MW-5S), or in well MW-3S, located sidegradient from wells MW-4S and MW-5S. Well MW-8S, located south of well MW-5S, had lower detections of PCE, TCE,

and cis-1,2-dichloroethene than MW-5S. None of the wells sampled contained detectable vinyl chloride.

Wells MW-4S, MW-10S, and C33 were sampled to confirm earlier data. Well C33R (replacing C33) has not been sampled for chlorinated VOCs since 1991. Concentrations at well C33R are an order of magnitude lower than they were 15 years ago. Concentrations at well MW-5S averaged slightly higher (within 10%) than those in previous years. Well MW-4S concentrations are somewhat lower than those previously observed (Table 2). Concentrations in 2006-2007 at remaining wells were within the range of historically observed concentrations.

Figures 8 through 13 present the observed trends of PCE and TCE, as well as historical water levels, along a transect from upgradient well OW-50 to downgradient well MW-10S. These figures show some relatively significant fluctuations of observed VOC concentrations; the long-term trend, however, has remained relatively stable. There are inconclusive correlations between VOC concentrations and water level trends. When water levels reach a given elevation within a regime of clay lenses, VOC mass that is trapped in the clay can be mobilized. The resulting VOC slug will gradually make its way to downgradient wells at a timing that does not necessarily coincide with water level fluctuations. The slug effect causes VOC fluctuations to appear more pronounced closer to a source area and less pronounced toward the plume periphery, due to plume dispersion. Over an extended distance, the individual VOC slugs merge into a longer single plume that has a stable concentration at the maximum plume extent. Similar temporal concentration fluctuations have been observed at a New Jersey site with similar geology, for which extensive ground water monitoring data were available.

The PCE concentration at the eastern plume extent wells C5 and 9MW-4 over the past four quarters has remained below its 5 ug/l maximum contaminant level, indicating that the off-site VOC plume is stable at its downgradient extent. Based on the observed stability of the downgradient reaches of the plume, we believe that the downgradient extent of PCE-affected ground water has been adequately defined.

We trust that the information provided herein will enable DNREC and USEPA to conclude the investigation phase of the project. Should you

have any questions regarding this report, please contact me at 610-524-3511.

Sincerely,

Ruth E Baker

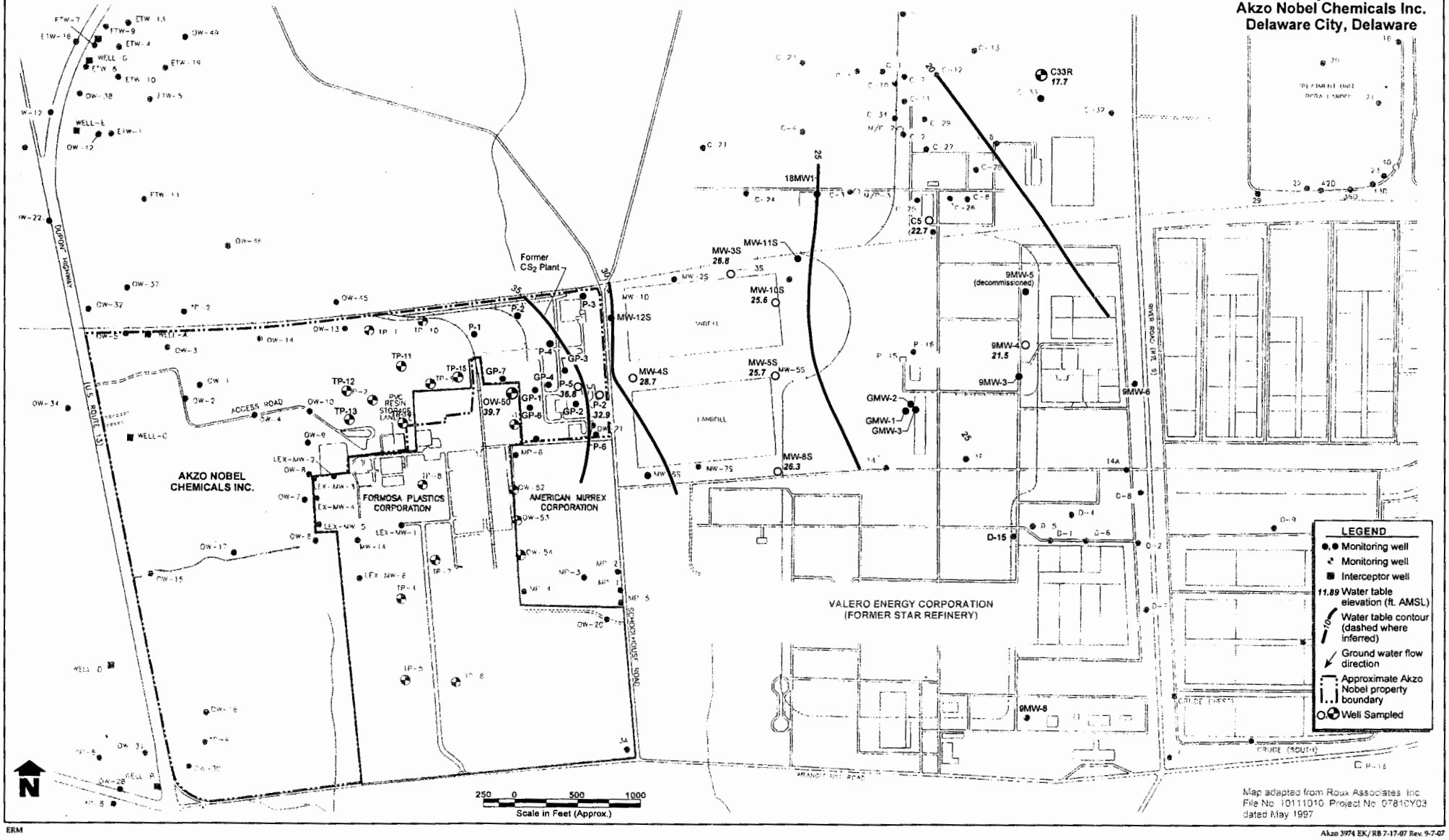
Ruth E. Baker, P.E.
Project Manager

cc: E. Trinkle, DNREC
M. Tehrani, Akzo
J. Miller, Akzo
R. Dulcey, ERM

Attachments

Figures

Figure 1
Water Table Map
May 2006
Akzo Nobel Chemicals Inc.
Delaware City, Delaware

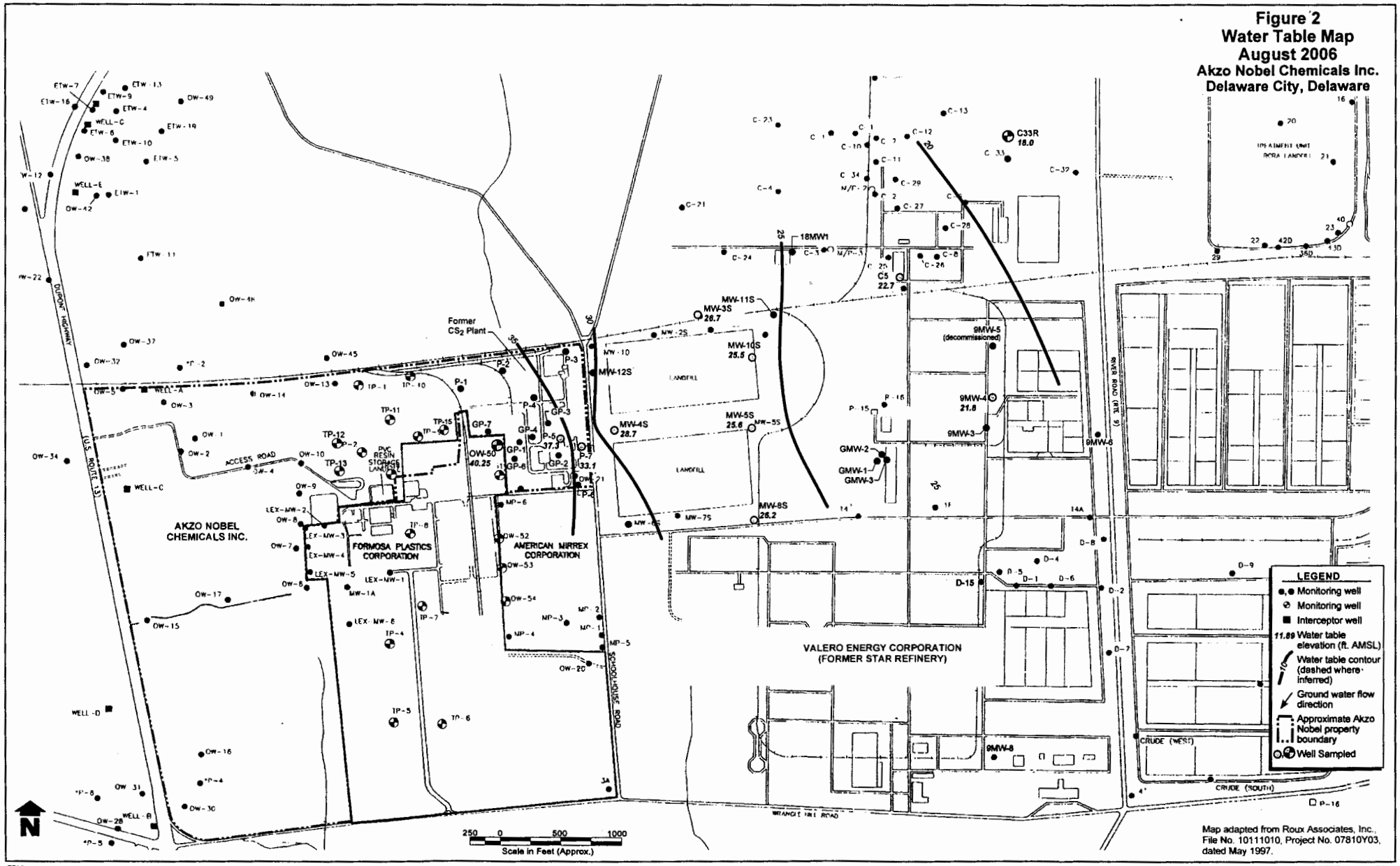


Map adapted from Roux Associates Inc
File No. 10111016 Project No. 07810Y03
dated May 1997

ERM

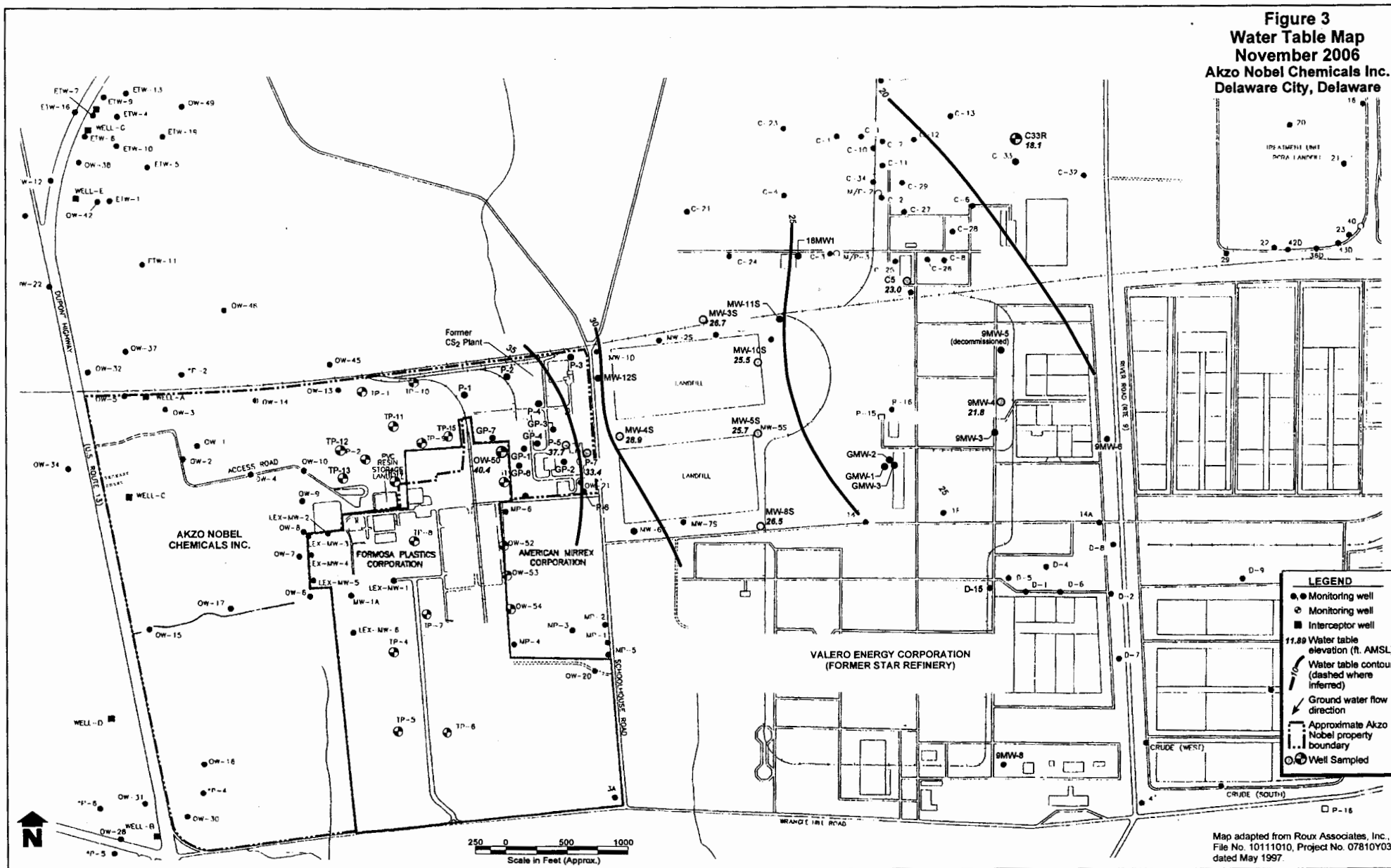
Akzo 3974 EK/RB 7-17-07 Rev. 9-7-07

Figure 2
Water Table Map
August 2006
Akzo Nobel Chemicals Inc.
Delaware City, Delaware



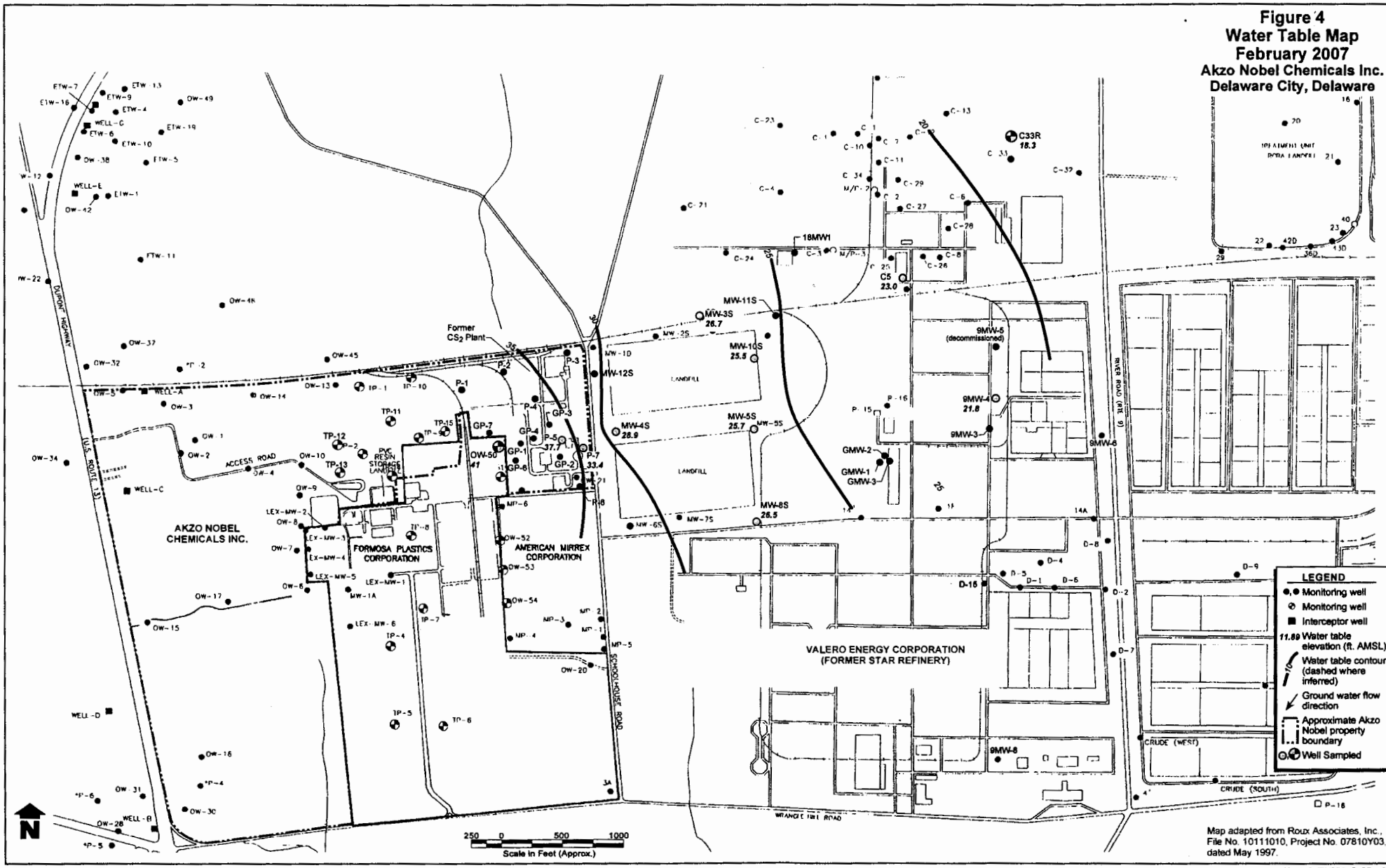
Map adapted from Roux Associates, Inc., File No. 10111010, Project No. 07810Y03, dated May 1997.

Figure 3
Water Table Map
November 2006
Akzo Nobel Chemicals Inc.
Delaware City, Delaware

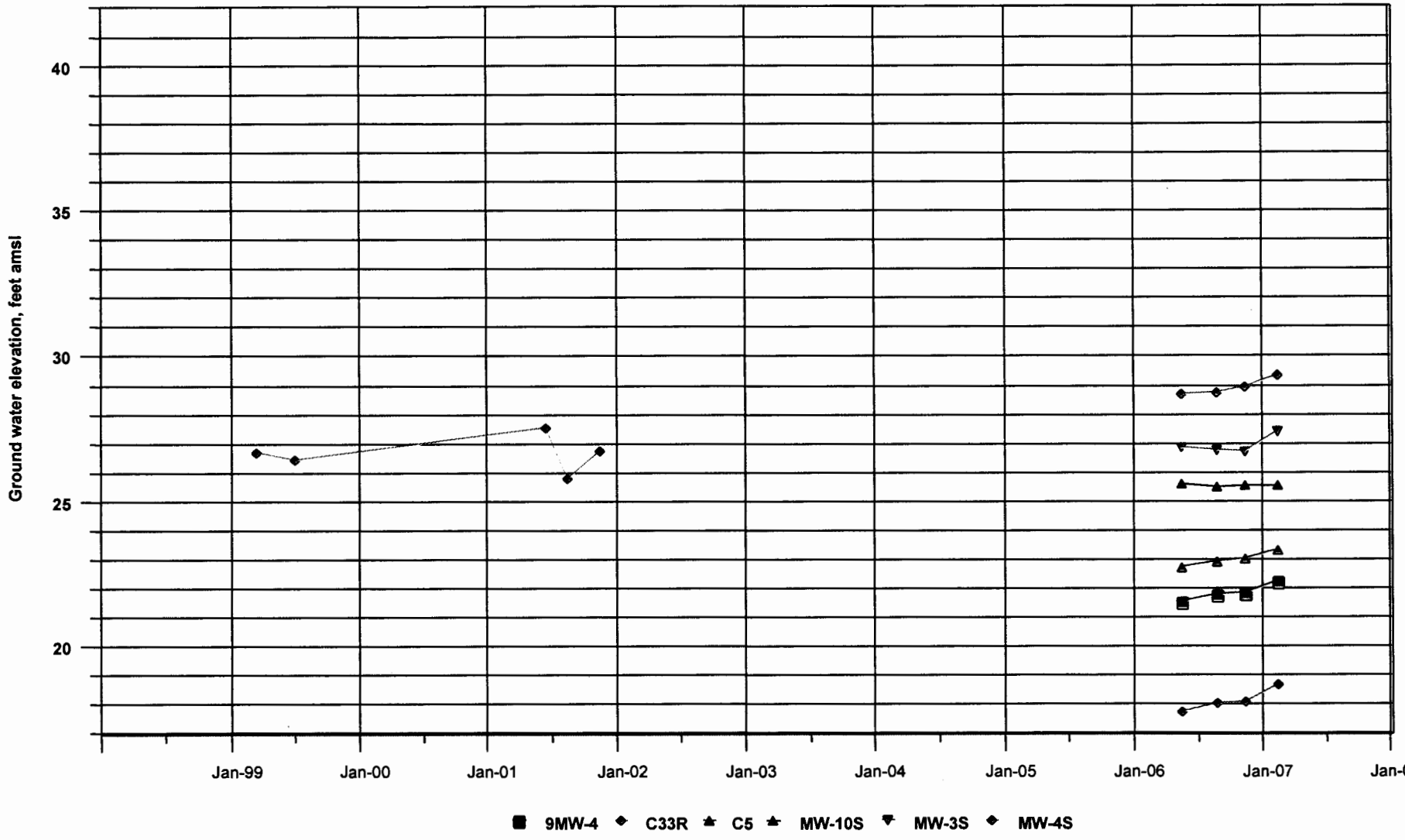


Map adapted from Roux Associates, Inc., File No. 10111010, Project No. 07810Y03, dated May 1997.

Figure 4
Water Table Map
February 2007
Akzo Nobel Chemicals Inc.
Delaware City, Delaware



Map adapted from Roux Associates, Inc., File No. 10111010, Project No. 07810Y03, dated May 1997.



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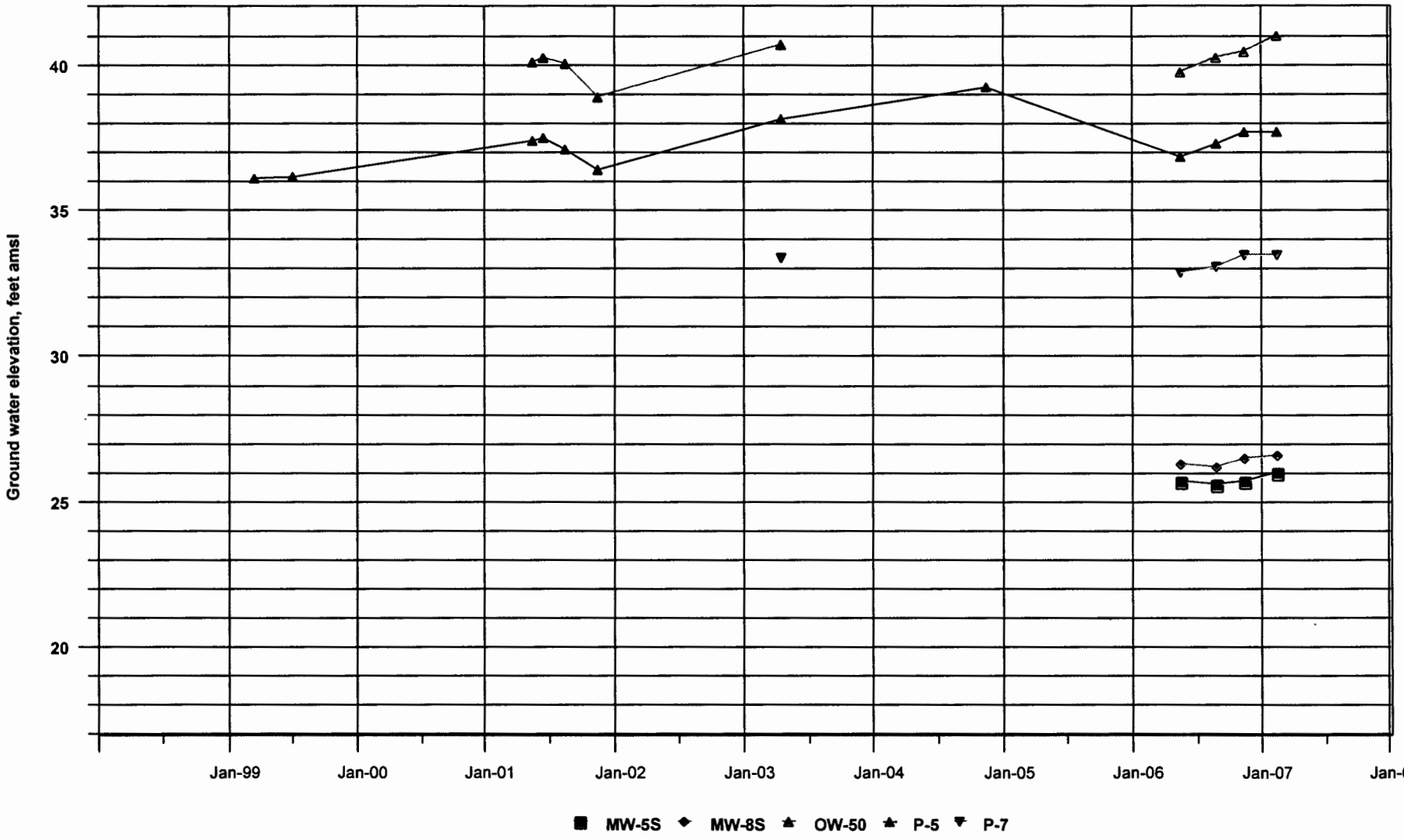
Hydrographs
Akzo Nobel Chemicals Inc.
Delaware City, DE

Figure 5



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Hydrographs
Akzo Nobel Chemicals Inc.
Delaware City, DE

Figure 6

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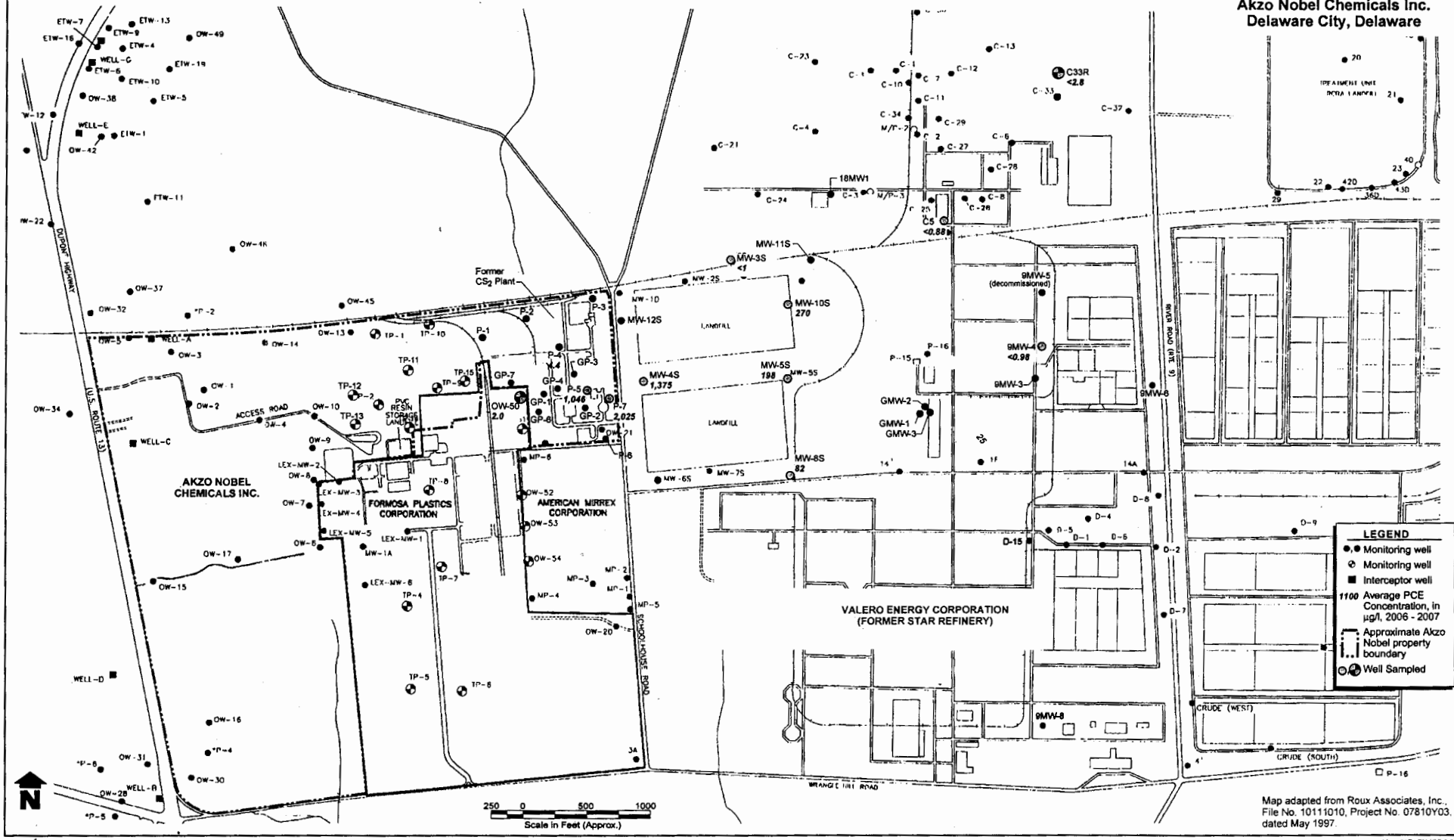
Figure 7
Observed Average PCE Concentrations (2006 - 2007)
Akzo Nobel Chemicals Inc.
Delaware City, Delaware



Map adapted from Roux Associates, Inc., File No. 10111010, Project No. 07810Y03, dated May 1997.

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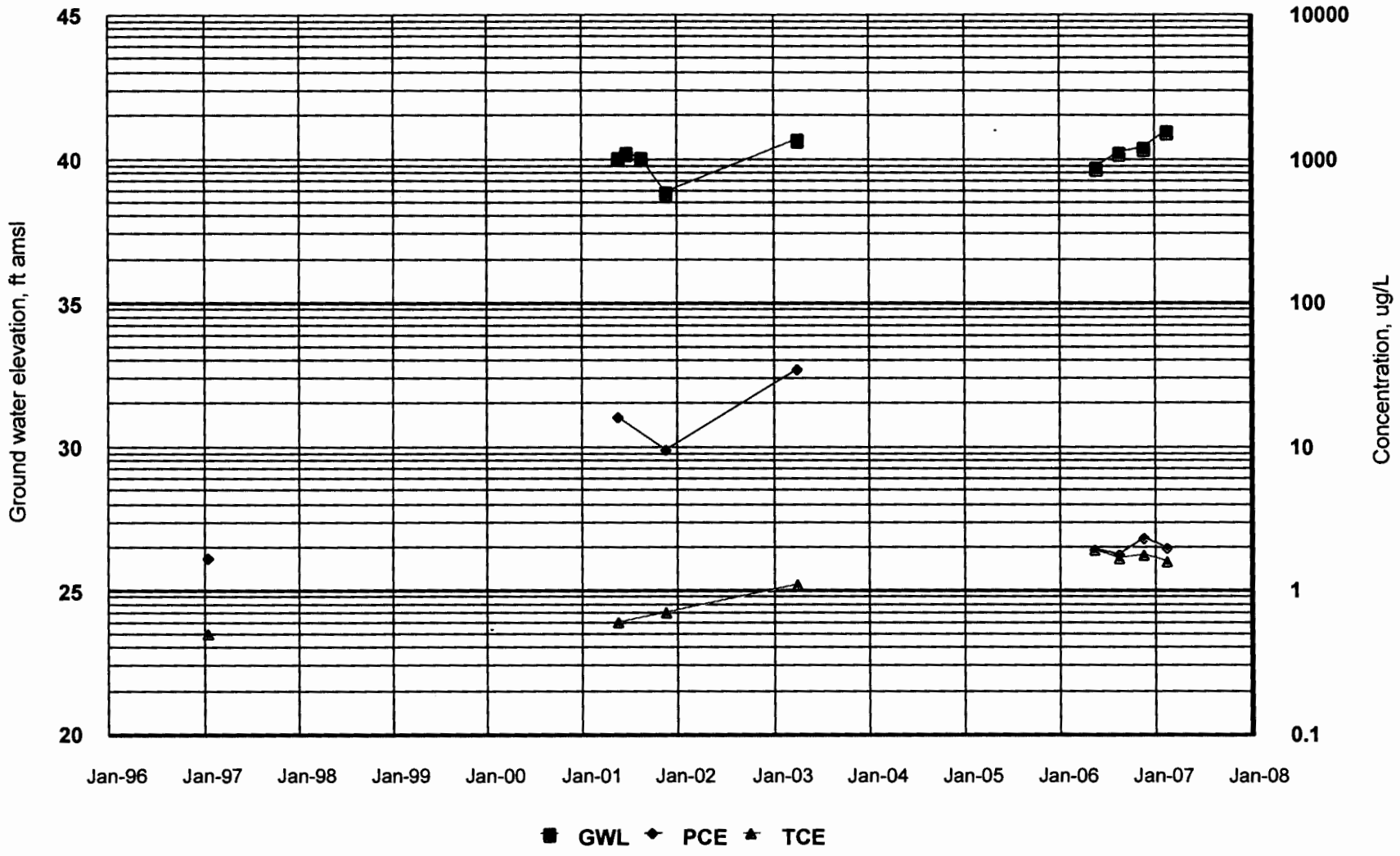

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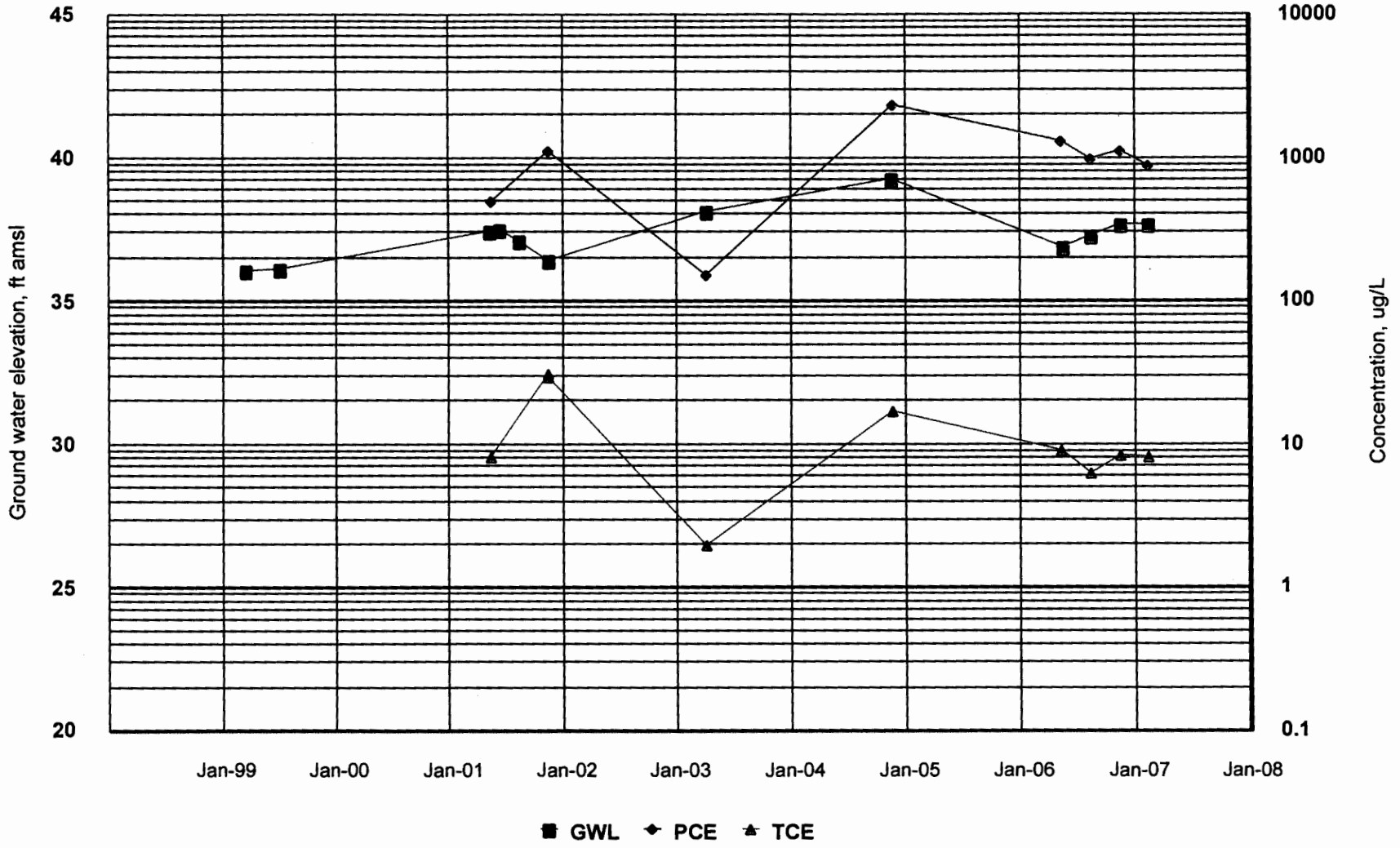
Hydrograph and VOC Concentration Trends
Akzo Nobel Chemicals Inc.
Delaware City, DE

Figure 8



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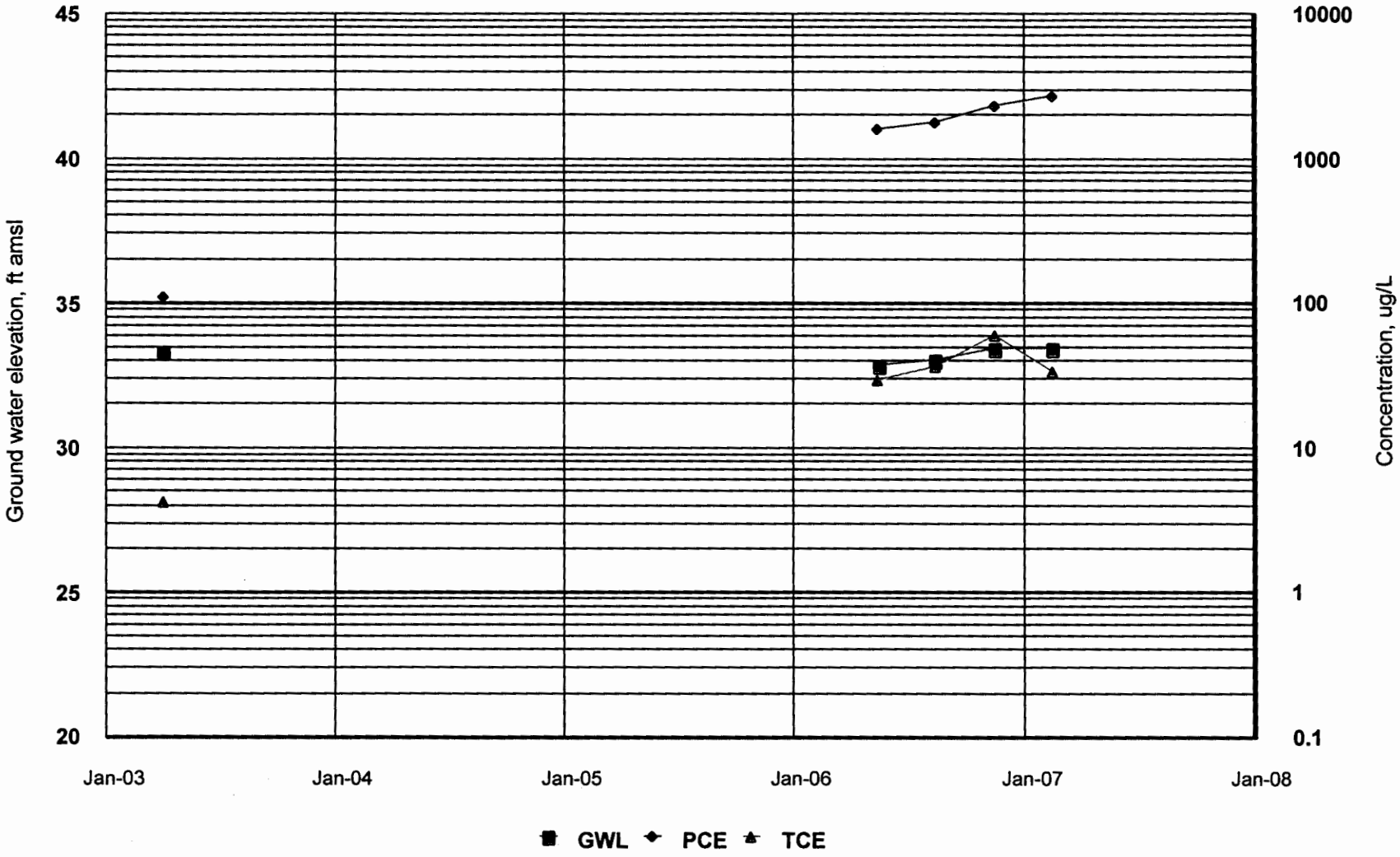
Hydrograph and VOC Concentration Trends
Akzo Nobel Chemicals Inc.
Delaware City, DE

Figure 9



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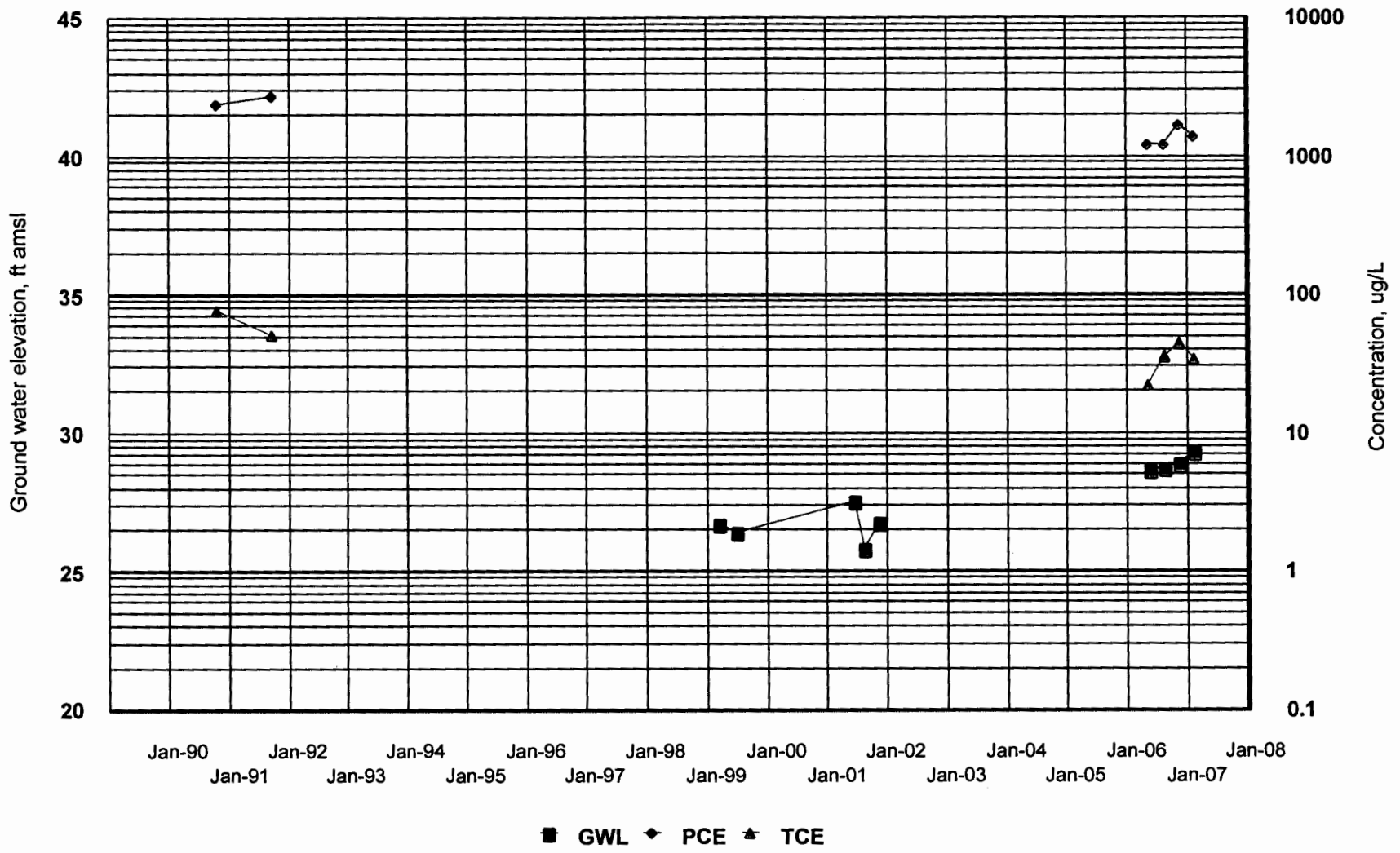
Hydrograph and VOC Concentration Trends
Akzo Nobel Chemicals Inc.
Delaware City, DE

Figure 10



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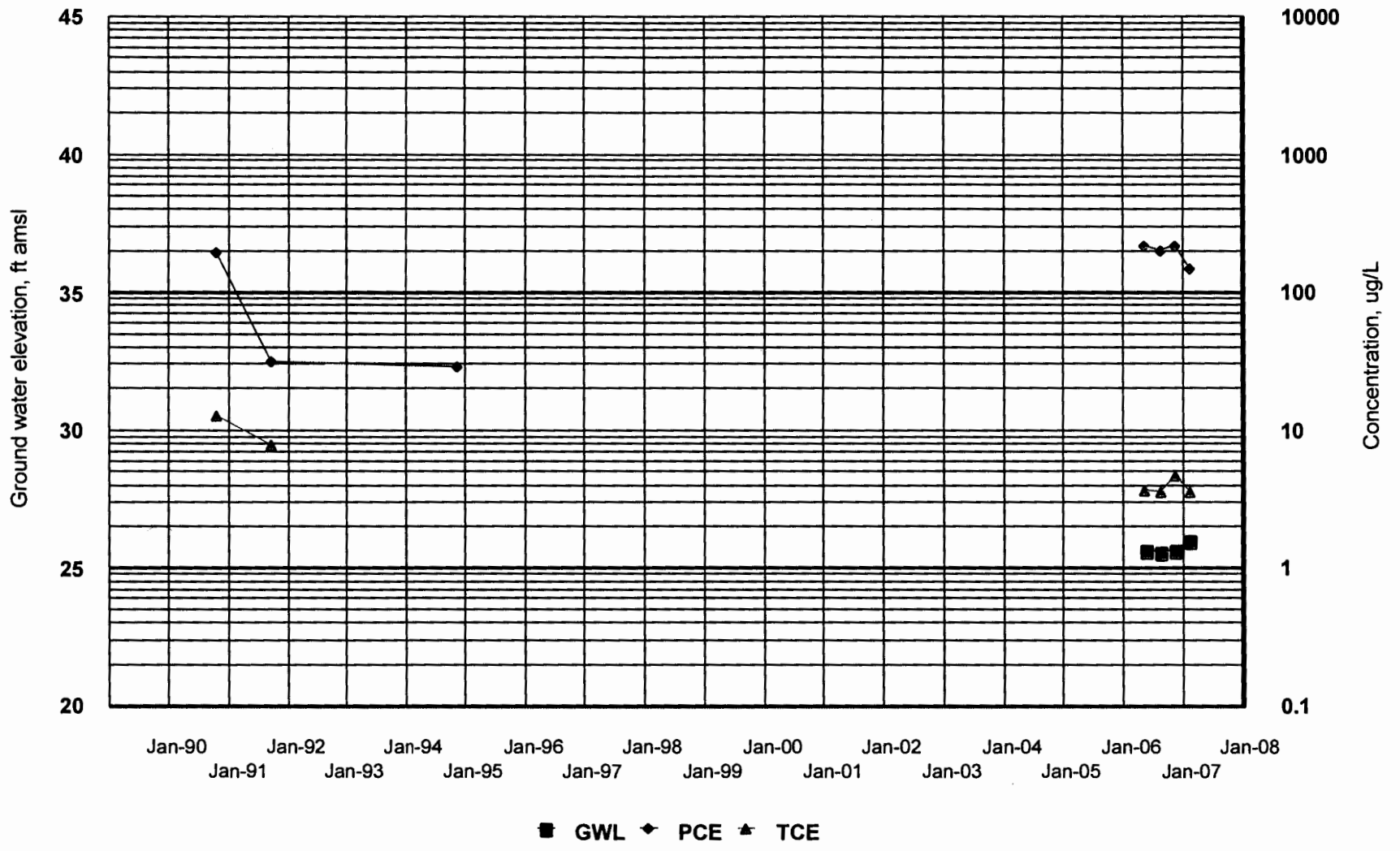
Hydrograph and VOC Concentration Trends
Akzo Nobel Chemicals Inc.
Delaware City, DE

Figure 11



ERM 350 Eagleview Boulevard Suite 200 Exton, PA 19341-1155	Hydrograph and VOC Concentration Trends Akzo Nobel Chemicals Inc. Delaware City, DE	Figure 12

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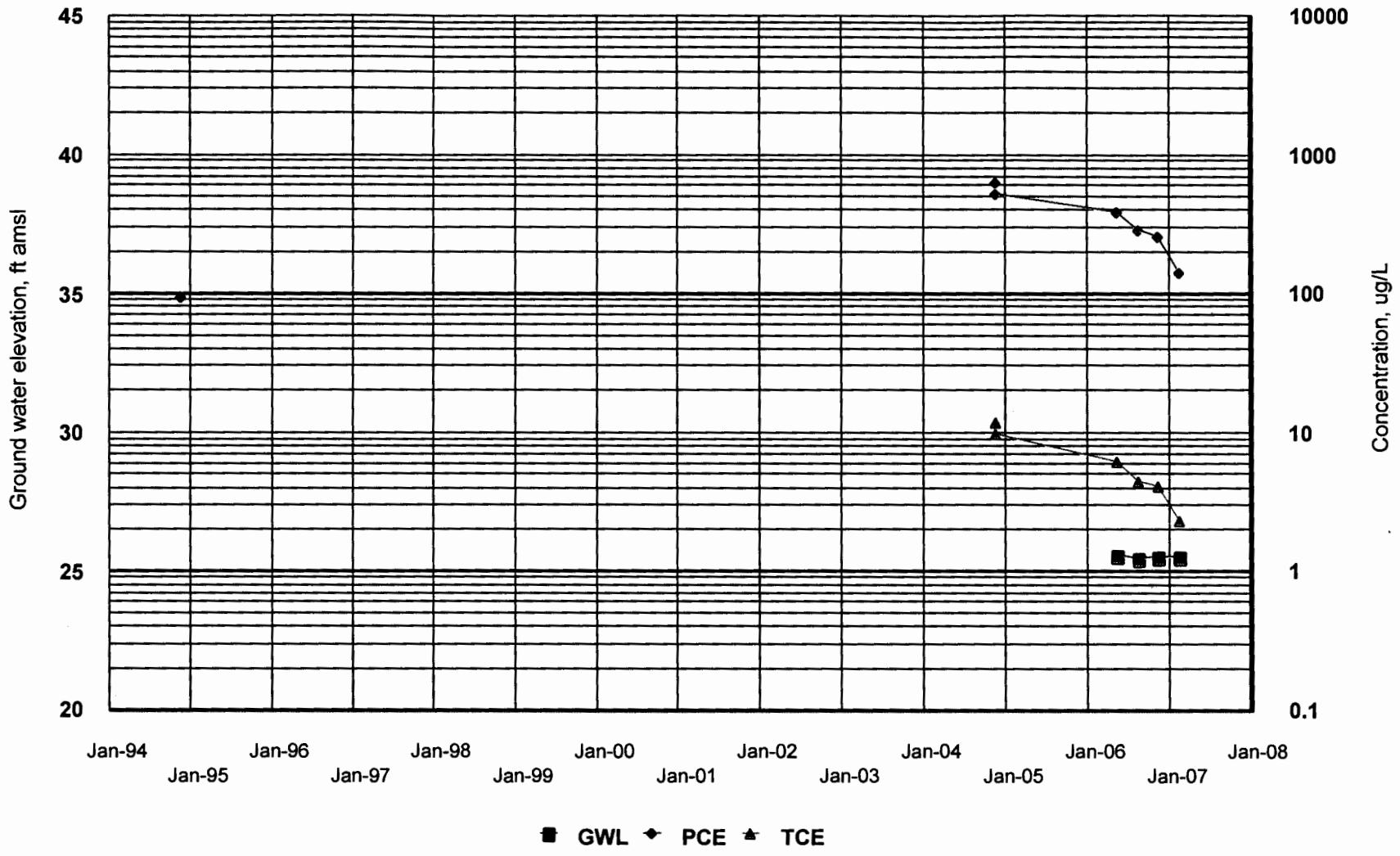

ERM 350 Eagleview Boulevard Suite 200 Exton, PA 19341-1155	Hydrograph and VOC Concentration Trends Akzo Nobel Chemicals Inc. Delaware City, DE	Figure 13

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Tables

Table 1
Historical Ground Water Levels
Akzo Nobel Chemicals Inc. and Surrounding Premises
Delaware City, Delaware

Well ID	3/15/99	6/30/99	5/15/01	6/15/01	8/15/01	11/15/01	4/15/03	11/15/04	5/18/06	8/28/06	11/15/06	2/15/07
9MW-4									21.53	21.77	21.8	22.21
C33R									17.74	18	18.09	18.67
C5									22.69	22.88	23.01	23.32
MW-10S									25.58	25.48	25.52	25.52
MW-12S	26.56	26.30		26.3	27.7	26.63						
MW-3S									26.82	26.72	26.7	27.36
MW-4S	26.7	26.43		27.55	25.81	26.74			28.67	28.73	28.91	29.33
MW-5S									25.67	25.58	25.67	25.98
MW-6S	27.48	27.15	18.15	18.25	17.37							
MW-8S									26.29	26.21	26.49	26.59
OW-50			40.06	40.22	40.04	38.88	40.68		39.73	40.25	40.42	40.98
OW-51	38.84	38.06	39.78	40.07	39.66	38.52	40.76					
P-4	37.06	36.89	38.86	39.13	38.56	37.53	40.06					
P-5	36.09	36.14	37.41	37.5	37.11	36.41	38.12	39.24	36.84	37.29	37.69	37.68
P-6	32.87	32.94	34.36	34.45	34.27	33.41	34.79					
P-7							33.35		32.86	33.07	33.44	33.44

Units: feet amsl

Table 2
Historical PCE/TCE Concentrations in Columbia Formation Wells

Well No /Activity	10/90 Roux, 1997, App. C	8/91 Roux, 1997, App. C	9/91 Roux, 1997, App. C	11/94 D&M, 1995, VRS	12/94 D&M, 1995, VRS	1/97 Roux, 1997	3/97 Roux, 1997	4/99 D&M, 2000 RFI	7/99 D&M, 2000 RFI	5/01 ERM, Phase II RFI	11/01 ERM, Phase II RFI	3-4/03 ERM, 7/20/03	11/04 ERM, 3/10/05	5/06 ERM	8/06 ERM	11/06 ERM	2/07 ERM
OW-50						1.7				16	9.5 B	35		1.9	1.8	2.3	2.0
						0.5				0.6J	0.7 J	1.1		1.9	1.7	1.8	1.6
OW-51						<0.3				<1	<1						
						<0.4				<1	<1						
P-4										2.4	3						
										<1	0.5 J						
P-5										410/490	1,000/1,100	150	2,300/1,530	1,300	970	1,100/1,000	870/860
										8.2	30/31	2	<20/17.1	9.1 J	6.3	8.4 J/7.1 J	8.2/8.8
P-6										6.4	11 B	64					
										1.3	6.7	1.3					
P-7												110		1,600	1,800	2,300	2,400
												4.2		30	37	60	34
MW-1S																	
MW-2S	<1		<1														
	2.3		<1														
MW-3S	<1		1.1											1 J	<1.0	<1.0	<1.0
appar. pumping 10/02	<1		<1											<1	<1.0	<1.0	<1.0
MW-4S	2,410		2,710											1,200	1,200/1,200	1,700	1,400
	78		52											22	36/35	45	34
MW-5S	197		32	29										220	200	220	150
	13		7.9	NS										3.7	3.6	4.7	3.6
MW-6S	<1		71				0.32										
damaged, not sampled	5.6		11				0.63										
MW-7S	<1		48				0.47										
decommissioned	24		4.5				1.4										
MW-8S	3.4		182				0.81						<1/<1	120	110	75	23
	150		26				<0.4						0.7 J/0.83 J	2.9	2.7	2.5	1.2
MW-9S																	
MW-10S				93									630/519	390	290	260	140
				NS									12/9.8	6.1	4.4	4.1	2.3
MW-11S																	
MW-12S								<1	<10								
								<1	<10								
28																	
9MW-3					<1												
9MW-4					2.1									0.9 J	<1.0	<1.0	<1.0
														<1	<1.0	<1.0	<1.0
9MW-5					2.2												

Table 2
Historical PCE/TCE Concentrations in Columbia Formation Wells

Well No./Activity	10/90 Roux, 1997, App. C	8/91 Roux, 1997, App. C	9/91 Roux, 1997, App. C	11/94 D&M, 1995, VRS	12/94 D&M, 1995, VRS	1/97 Roux, 1997	3/97 Roux, 1997	4/99 D&M, 2000 RFI	7/99 D&M, 2000 RFI	5/01 ERM, Phase II RFI	11/01 ERM, Phase II RFI	3-4/03 ERM, 7/20/03	11/04 ERM, 3/10/05	5/06 ERM	8/06 ERM	11/06 ERM	2/07 ERM
9MW-6					<1			<1	<10								
								<1	<10								
C-2			<1														
			<1														
C-3																	
C-4			<1														
			<1														
C-5		<1												0.5 J	<1.0	<1.0	<1.0
		<1												<1	<1.0	<1.0	<1.0
C-6		<1															
pumping 1991, 98, 2001		<1															
C-8		<1															
		<1															
C-11																	
C-24			<1					<1	<10								
			<1					<1	<10								
C-25																	
C-26																	
C-27																	
C-28																	
C-29			1.3														
pumping 1998, 2001, 03			<1														
C-32			<1										0.8 J/0.7 J				
	1		<1										<1/<1				
C-33			19											2.3	3.4	4.4	<1.0
replaced w/ C-33R			<1											<1	<1.0	<1.0	<1.0
C-34																	
GMW-1																	
GMW-2																	
GMW-3																	
18MW-1								<1	<10								
								<1	<10								

Note: PCE data reported on first line; TCE data reported on second line of each cell.
all concentrations in ppb

Appendices

Appendix A
Field Parameter Measurements

Table A-1
Ground Water Field Parameters
November 2006
Akzo Nobel Chemicals Inc. and Adjoining Properties
Delaware City, Delaware

Well ID	Date	pH (S.U.)	Conductivity (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)	Temperature (Celsius)	ORP (mV)
9MW-4	11/20/06	6.33	1,535	0.0	1.12	19.06	201.7
C-33R	11/17/06	5.52	1,845	7.0	4.83	17.43	258.5
C-5	11/17/06	5.73	1,508	0.0	1.83	15.59	242.1
MW-3S	11/21/06	5.51	451	0.0	5.13	13.27	273.3
MW-4S	11/20/06	6.02	502	0.7	6.58	14.71	223
MW-5S	11/20/06	5.66	409	0.0	7.93	13.14	256.4
MW-8S	11/20/06	5.73	425	0.0	6.67	13.82	248.1
MW-10S	11/21/06	5.77	671	0.0	2.52	13.74	254.9
OW-50	11/17/06	5.24	1,077	0.0	3.54	14.06	286.7
P-5	11/21/06	6.10	489	3.3	8.61	15.15	246.7
P-7	11/21/06	6.08	471	6.2	7.19	14.87	246

Note: ORP- Oxidation-Reduction Potential

Table A-1
Ground Water Field Parameters
February 2007
Akzo Nobel Chemicals Inc. and Adjoining Properties
Delaware City, Delaware

Well ID	Date	pH (S.U.)	Conductivity (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)	Temperature (Celsius)	ORP (mV)
9MW-4	2/27/07	6.45	990	0.5	1.23	18.37	203.1
C-33R	2/26/07	5.22	2,561	42.5	4.67	16.15	245.1
C-5	2/27/07	6.09	763	4.9	2.90	13.92	220
MW-3S	2/26/07	5.76	275	5.4	5.44	13.34	233.8
MW-4S	2/27/07	6.19	264	0.8	6.7	14.11	218.8
MW-5S	2/27/07	5.85	218	1.6	7.59	14.28	246.1
MW-8S	2/28/07	5.91	242	6.7	6.77	13.09	253.0
MW-10S	2/27/07	5.95	362	1.9	1.37	13.56	255.3
OW-50	2/27/07	5.49	596	3.2	5.92	12.52	241.2
P-5	2/28/07	6.34	303	8.3	8.50	14.77	231.1
P-7	2/28/07	6.26	249	9.3	8.3	14.55	237.2

Note: ORP- Oxidation-Reduction Potential

Appendix B
Data Validation Reports

ANALYTICAL QUALITY ASSURANCE REPORT

Akzo Nobel Chemicals Inc.
Delaware City, Delaware

Supplemental Tetrachloroethene (PCE) Delineation Results

Samples Collected November 17, 20, and 21, 2006

8 January 2007

Environmental Resources Management
350 Eagleview Boulevard
Suite 200
Exton, Pennsylvania 19341
File No: 0003974

ANALYTICAL QUALITY ASSURANCE REPORT

Akzo Nobel Chemicals Inc.
Delaware City, Delaware

Supplemental Tetrachloroethene (PCE) Delineation Results

Samples Collected November 17, 20, and 21, 2006

8 January 2007

Joseph M. Loeper, Ph.D.
Senior Quality Assurance Chemist

Environmental Resources Management
350 Eagleview Boulevard
Suite 200
Exton, Pennsylvania 19341

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LIST OF TABLES

1.0 INTRODUCTION

This analytical quality assurance report is based on the review of ground water samples and associated field quality control samples collected at the Akzo Nobel Chemicals, Inc. site located in Delaware City, Delaware. The samples were collected on November 17, 20, and 21, 2006 to delineate the extent of tetrachloroethene (PCE) and daughter compounds concentrations at, and in the vicinity of, the site. The analytical method that was used for the analysis is summarized and referenced in Attachment 1. The sample locations, laboratory identification (ID) numbers, sample collection dates, sample matrix, and analysis performed are presented in Table 1-1. Data summary tables presenting the validated and qualified results are included in Attachment 2.

Data for these analyses have been reviewed for adherence to the specified analytical protocols. All results have been validated or qualified according to general guidance provided in the "USEPA Region III Innovative Approaches to Data Validation, June 1995, Level M3" and "Region III Modifications to National Functional Guidelines for Organic Data Review" (September 1994).

Table 1-1 *Summary of Sampling Data Reviewed*
Supplemental Tetrachloroethene Delineation
Akzo Nobel Chemicals, Inc.
Delaware City, Delaware

Sample Location	Laboratory ID Number	Date Sampled	Matrix	Analysis Performed
C-5	787180	11/17/06	Ground Water	[1]
C-33R	787178	11/17/06	Ground Water	[1]
P-5	787192	11/21/06	Ground Water	[1]
P-5D*	787193	11/21/06	Ground Water	[1]
P-7	787194	11/21/06	Ground Water	[1]
MW-3S	787190	11/21/06	Ground Water	[1]
MW-4S	787186	11/20/06	Ground Water	[1]
MW-5S	787184	11/20/06	Ground Water	[1]
MW-8S	787187	11/20/06	Ground Water	[1]
9MW-4	787183	11/20/06	Ground Water	[1]

[1] = Volatile organic compounds; vinyl chloride, cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene (EPA SW-846 Method 8260B).

* - This sample is a field duplicate of sample P-5.

Table 1-1 *Summary of Sampling Data Reviewed (continued)*
Supplemental Tetrachloroethene Delineation
Akzo Nobel Chemicals, Inc.
Delaware City, Delaware

Sample Location	Laboratory ID Number	Date Sampled	Matrix	Analysis Performed
MW-10S	787189	11/21/06	Ground Water	[1]
OW-50	787181	11/17/06	Ground Water	[1]
TB-01 (111706)	787177	11/17/06	DI Water	[1]
EB-01 (111706)	787179	11/17/06	DI Water	[1]
TB-01 (112006)	787182	11/20/06	DI Water	[1]
EB-01 (112006)	787185	11/20/06	DI Water	[1]
TB-01 (112106)	787188	11/21/06	DI Water	[1]
EB-01 (112106)	787191	11/21/06	DI Water	[1]

[1] = Volatile organic compounds; vinyl chloride, cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene (EPA SW-846 Method 8260B).
* - This sample is a field duplicate of sample P-5.

2.0 *ORGANIC DATA*

The analysis of ground water samples and associated quality control samples for volatile organic compounds was performed by Severn Trent Laboratories, Inc. of Edison, New Jersey. The samples were analyzed for the volatile organic compounds vinyl chloride, cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene according to the protocols specified in EPA SW-846 Method 8260B.

The findings presented in this report are based on a comprehensive review of the data for the referenced ground water samples. The review was based on an evaluation of the following items, reported according to the CLP-equivalent deliverables format: chain of custody documentation; holding times; laboratory method, trip, and equipment blank results; surrogate compound recoveries; laboratory control sample recoveries; matrix spike compound recoveries and reproducibility; field duplicate analysis results; bromofluorobenzene (BFB) mass tuning results; initial and continuing calibration data; internal standard performance; quantitation of results; and qualitative mass spectral interpretation.

The organic analyses were performed acceptably, but require qualifying statements. It is recommended that the analytical results be used only with the qualifying statements presented in this report. Any aspects of the data that are not qualified in this review should be considered quantitatively and qualitatively valid as reported, based on the criteria evaluated. Data summary tables presenting the qualified and/or validated results are included in Attachment 2.

2.1 *ORGANIC DATA QUALIFIERS*

- As required by USEPA protocol, all compounds that were qualitatively identified at concentrations below their respective quantitation limits (QLs) have been reported with "J" qualifiers on the data summary table to indicate that they are quantitative estimates.
- Ground water samples P-5, P-5D, P-7, MW-4S, MW-5S, and MW-10S were analyzed at initial dilutions because of elevated levels of target compounds in these samples. The dilutions were required to prevent saturation of the instrument and to allow quantitation of target compounds within the linear calibration range. Thus, higher quantitation limits are reported for target compounds that were not detected in these samples. These elevated quantitation limits should be noted when assessing the data for the quantitative absence of target compounds in these samples.

- Ground water sample P-5 and its field duplicate sample, P-5D, were submitted to the laboratory to evaluate sampling and analytical precision for those volatile organic compounds determined to be confidently detected.

  All compounds detected in this duplicate pair met ERM's field duplicate precision criterion of 20% Relative Percent Difference (RPD) for aqueous samples.

3.0 SUMMARY

In general, the analyses were performed acceptably, but required qualifying statements. This analytical quality assurance report has identified the aspects of the analytical data that have required qualifying statements. A support documentation package further detailing these findings has been prepared and is filed with the Akzo Nobel Chemicals, Inc. project information.

Attachment 1
Methodology Summary and Method Reference

Analysis for Volatile Organic Compounds by GC/MS

A water sample aliquot containing surrogate compounds and internal standards was purged with helium, transferring the purgeable compounds onto a sorbent trap. After purging, the trap was heated and backflushed to desorb the compounds onto a gas chromatographic column. The gas chromatograph was temperature programmed to separate the sample components, which were then detected by a mass spectrometer. The target compounds were qualitatively identified and quantitated through calibration with standards.

Analysis	Reference
Volatile Organic Compounds	Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition, Method 8260B.

Attachment 2
Data Summary Tables

Analytical Results for Ground Water Samples
Supplemental Tetrachloroethene Delineation
Akzo Nobel Chemicals, Inc.
Delaware City, Delaware

SAMPLE LOCATION:	C-5		C-33R		P-5		P-5D*		P-7	
LAB SAMPLE ID:	787180		787178		787192		787193		787194	
DATE COLLECTED:	11/17/2006		11/17/2006		11/21/2006		11/21/2006		11/21/2006	
MATRIX:	Ground Water		Ground Water		Ground Water		Ground Water		Ground Water	
Volatile Compounds (µg/L)										
Vinyl Chloride	5.0	U	5.0	U	50	U	50	U	100	U
cis-1,2-Dichloroethene	5.0	U	5.0	U	6.4	J	7.1	J	52	J
Trichloroethene	1.0	U	1.0	U	8.4	J	7.1	J	60	
Tetrachloroethene	1.0	U	4.4		1,100		1,000		2,300	

SAMPLE LOCATION:	MW-3S		MW-4S		MW-5S		MW-8S		9MW-4	
LAB SAMPLE ID:	787190		787186		787184		787187		787183	
DATE COLLECTED:	11/21/2006		11/20/2006		11/20/2006		11/20/2006		11/20/2006	
MATRIX:	Ground Water		Ground Water		Ground Water		Ground Water		Ground Water	
Volatile Compounds (µg/L)										
Vinyl Chloride	5.0	U	50	U	10	U	5.0	U	5.0	U
cis-1,2-Dichloroethene	5.0	U	53		6.0	J	3.1	J	5.0	U
Trichloroethene	1.0	U	45		4.7		2.5		1.0	U
Tetrachloroethene	1.0	U	1,700		220		75		1.0	U

Qualifier Codes:

U - This compound was not detected. The numerical value reported represents the sample quantitation limit for this compound.

J - This result should be considered a quantitative estimate.

* - This sample is a field duplicate of sample P-5.

Analytical Results for Ground Water Samples
Supplemental Tetrachloroethene Delineation
Akzo Nobel Chemicals, Inc.
Delaware City, Delaware

SAMPLE LOCATION:	MW-10S		OW-50		TB-01 (111706)		EB-01 (111706)	
LAB SAMPLE ID:	787189		787181		787177		787179	
DATE COLLECTED:	11/21/2006		11/17/2006		11/17/2006		11/17/2006	
MATRIX:	Ground Water		Ground Water		DI Water		DI Water	
Volatile Compounds (µg/L)								
Vinyl Chloride	10	U	5.0	U	5.0	U	5.0	U
cis-1,2-Dichloroethene	5.5	J	5.0	U	5.0	U	5.0	U
Trichloroethene	4.1		1.8		1.0	U	1.0	U
Tetrachloroethene	260		2.3		1.0	U	1.0	U

SAMPLE LOCATION:	TB-01 (112006)		EB-01 (112006)		TB-01 (112106)		EB-01 (112106)	
LAB SAMPLE ID:	787182		787185		787188		787191	
DATE COLLECTED:	11/20/2006		11/20/2006		11/21/2006		11/21/2006	
MATRIX:	DI Water		DI Water		DI Water		DI Water	
Volatile Compounds (µg/L)								
Vinyl Chloride	5.0	U	5.0	U	5.0	U	5.0	U
cis-1,2-Dichloroethene	5.0	U	5.0	U	5.0	U	5.0	U
Trichloroethene	1.0	U	1.0	U	1.0	U	1.0	U
Tetrachloroethene	1.0	U	1.0	U	1.0	U	1.0	U

Qualifier Codes:

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ANALYTICAL QUALITY ASSURANCE REPORT

Akzo Nobel Chemicals Inc.
Delaware City, Delaware

Supplemental Tetrachloroethene (PCE) Delineation Results

Samples Collected

26, 27, and 28 February 2007

22 April 2007

Environmental Resources Management
350 Eagleview Boulevard
Suite 200
Exton, Pennsylvania 19341
File No: 0003974

ANALYTICAL QUALITY ASSURANCE REPORT

Akzo Nobel Chemicals Inc.
Delaware City, Delaware

Supplemental Tetrachloroethene (PCE) Delineation Results

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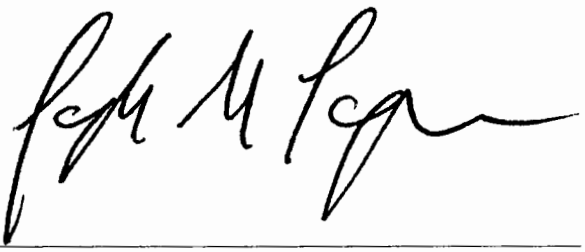

Joseph M. Loeper, Ph.D.
Senior Quality Assurance Chemist

Environmental Resources Management
350 Eagleview Boulevard
Suite 200
Exton, Pennsylvania 19341

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ATTACHMENTS

LIST OF TABLES

1.0 INTRODUCTION

This analytical quality assurance report is based on the review of ground water samples and associated field quality control samples collected at the Akzo Nobel Chemicals Inc. site located in Delaware City, Delaware, and adjoining properties. The samples were collected on February 26, 27, and 28, 2007 to delineate the extent of tetrachloroethene (PCE) and daughter compounds concentrations at, and in the vicinity of, the site. The analytical method that was used for the analysis is summarized and referenced in Attachment 1. The sample locations, laboratory identification (ID) numbers, sample collection dates, sample matrix, and analysis performed are presented in Table 1-1. Data summary tables presenting the validated and qualified results are included in Attachment 2.

Data for these analyses have been reviewed for adherence to the specified analytical protocols. All results have been validated or qualified according to general guidance provided in the "USEPA Region III Innovative Approaches to Data Validation, June 1995, Level M3" and "Region III Modifications to National Functional Guidelines for Organic Data Review" (September 1994).

Table 1-1 *Summary of Sampling Data Reviewed*
Supplemental Tetrachloroethene Delineation
Akzo Nobel Chemicals Inc.
Delaware City, Delaware

Sample Location	Laboratory ID Number	Date Sampled	Matrix	Analysis Performed
C-5	810928	2/27/07	Ground Water	[1]
C-33R	810921	2/26/07	Ground Water	[1]
P-5	810937	2/28/07	Ground Water	[1]
P-5D*	810938	2/28/07	Ground Water	[1]
P-7	810936	2/28/07	Ground Water	[1]
MW-3S	810922	2/26/07	Ground Water	[1]
MW-4S	810931	2/27/07	Ground Water	[1]
MW-5S	810932	2/27/07	Ground Water	[1]
MW-8S	810935	2/28/07	Ground Water	[1]
9MW-4	810926	2/27/07	Ground Water	[1]

[1] = Volatile organic compounds; vinyl chloride, cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene (EPA SW-846 Method 8260B).

* - This sample is a field duplicate of sample P-5.

Table 1-1 *Summary of Sampling Data Reviewed (continued)*
Supplemental Tetrachloroethene Delineation
Akzo Nobel Chemicals Inc.
Delaware City, Delaware

Sample Location	Laboratory ID Number	Date Sampled	Matrix	Analysis Performed
MW-10S	810933	2/27/07	Ground Water	[1]
OW-50	810925	2/27/07	Ground Water	[1]
TB-01 (022607)	810920	2/26/07	DI Water	[1]
EB-01 (022607)	810923	2/26/07	DI Water	[1]
TB-01 (022707)	810924	2/27/07	DI Water	[1]
EB-01 (022707)	810927	2/27/07	DI Water	[1]
TB-01 (022807)	811651	2/28/07	DI Water	[1]
EB-01 (022807)	810939	2/28/07	DI Water	[1]

[1] = Volatile organic compounds; vinyl chloride, cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene (EPA SW-846 Method 8260B).
* - This sample is a field duplicate of sample P-5.

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- Ground water samples P-5, P-5D, P-7, and MW-4S were analyzed at initial dilutions because of elevated levels of target compounds in these samples. The dilutions were required to prevent saturation of the instrument and to allow quantitation of target compounds within the linear calibration range. Thus, higher quantitation limits are reported for target compounds that were not detected in these samples. These elevated quantitation limits should be noted when

assessing the data for the quantitative absence of target compounds in these samples.

- Ground water sample P-5 and its field duplicate sample, P-5D, were submitted to the laboratory to evaluate sampling and analytical precision for those volatile organic compounds determined to be confidently detected.

  All compounds detected in this duplicate pair met ERM's field duplicate precision criterion of 20% Relative Percent Difference (RPD) for aqueous samples.

3.0 *SUMMARY*

In general, the analyses were performed acceptably, but required qualifying statements. This analytical quality assurance report has identified the aspects of the analytical data that have required qualifying statements. A support documentation package further detailing these findings has been prepared and is filed with the Akzo Nobel Chemicals Inc. project information.

Attachment 1
Methodology Summary and Method Reference

ATTACHMENT 1 METHODOLOGY SUMMARY AND REFERENCE

Analysis for Volatile Organic Compounds by GC/MS

A water sample aliquot containing surrogate compounds and internal standards was purged with helium, transferring the purgeable compounds onto a sorbent trap. After purging, the trap was heated and backflushed to desorb the compounds onto a gas chromatographic column. The gas chromatograph was temperature programmed to separate the sample components, which were then detected by a mass spectrometer. The target compounds were qualitatively identified and quantitated through calibration with standards.

Analysis	Reference
Volatile Organic Compounds	Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition, Method 8260B.

Attachment 2
Data Summary Tables

Analytical Results for Ground Water Samples
Supplemental Tetrachloroethene Delineation
Akzo Nobel Chemicals, Inc. and Vicinity
Delaware City,
Delaware

SAMPLE LOCATION:	C-5		C-33R		P-5		P-5D*		P-7	
LAB SAMPLE ID:	810928		810921		810937		810938		810936	
DATE COLLECTED:	2/27/2007		2/26/2007		2/28/2007		2/28/2007		2/28/2007	
MATRIX:	Ground Water		Ground Water		Ground Water		Ground Water		Ground Water	
Volatile Compounds (µg/L)										
Vinyl Chloride	5.0	U	5.0	U	25	U	25	U	100	U
cis-1,2-Dichloroethene	5.0	U	5.0	U	11	J	11	J	34	J
Trichloroethene	1.0	U	1.0	U	8.2		8.8		34	
Tetrachloroethene	1.0	U	1.0	U	870		860		2,400	

SAMPLE LOCATION:	MW-3S		MW-4S		MW-5S		MW-8S		9MW-4	
LAB SAMPLE ID:	810922		810931		810932		810935		810926	
DATE COLLECTED:	2/26/2007		2/27/2007		2/27/2007		2/28/2007		2/27/2007	
MATRIX:	Ground Water		Ground Water		Ground Water		Ground Water		Ground Water	
Volatile Compounds (µg/L)										
Vinyl Chloride	5.0	U	50	U	5.0	U	5.0	U	5.0	U
cis-1,2-Dichloroethene	5.0	U	36	J	5.6		1.7	J	5.0	U
Trichloroethene	1.0	U	34		3.6		1.2		1.0	U
Tetrachloroethene	1.0	U	1,400		150		23		1.0	U

Qualifier Codes:

U - This compound was not detected. The numerical value reported represents the sample quantitation limit for this compound.

J - This result should be considered a quantitative estimate.

* - This sample is a field duplicate of sample P-5.

Analytical Results for Ground Water Samples
Supplemental Tetrachloroethene Delineation
Akzo Nobel Chemicals, Inc. and Vicinity
Delaware City,
Delaware

SAMPLE LOCATION:	MW-10S		OW-50		TB-01 (022607)		EB-01 (022607)	
LAB SAMPLE ID:	810933		810925		810920		810923	
DATE COLLECTED:	2/27/2007		2/27/2007		2/26/2007		2/26/2007	
MATRIX:	Ground Water		Ground Water		DI Water		DI Water	
Volatile Compounds (µg/L)								
Vinyl Chloride	5.0	U	5.0	U	5.0	U	5.0	U
cis-1,2-Dichloroethene	3.6	J	5.0	U	5.0	U	5.0	U
Trichloroethene	2.3		1.6		1.0	U	1.0	U
Tetrachloroethene	140		2.0		1.0	U	1.0	U

SAMPLE LOCATION:	TB-01 (022707)		EB-01 (022707)		TB-01 (022807)		EB-01 (022807)	
LAB SAMPLE ID:	810924		810927		811651		810939	
DATE COLLECTED:	2/27/2007		2/27/2007		2/28/2007		2/28/2007	
MATRIX:	DI Water		DI Water		DI Water		DI Water	
Volatile Compounds (µg/L)								
Vinyl Chloride	5.0	U	5.0	U	5.0	U	5.0	U
cis-1,2-Dichloroethene	5.0	U	5.0	U	5.0	U	5.0	U
Trichloroethene	1.0	U	1.0	U	1.0	U	1.0	U
Tetrachloroethene	1.0	U	1.0	U	1.0	U	1.0	U

Qualifier Codes:

U - This compound was not detected. The numerical value reported represents the sample quantitation limit for this compound.

J - This result should be considered a quantitative estimate.

* - This sample is a field duplicate of sample P-5.